

mood-book



Code No: 153AJ

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, April/May - 2023

COMPUTER ORIENTED STATISTICAL METHODS

(Common to CSE, IT, CE(SE), CSE(IOT), CSE(N))

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

- 1.a) If the probability is 0.05 that a certain kind of measuring device will show excessive drift, what is the probability that the sixth measuring device tested will be the first to show excessive drift? [2]
- b) The probability density function of a continuous random variable X is given by $P(x) = a e^{-|x|}$, where $-\infty < x < \infty$. Prove or disprove that $a = \frac{1}{2}$. [3]
- c) When is the geometric distribution an appropriate model? [2]
- d) If the mean of Binomial distribution is 3 and variance is $\frac{9}{4}$, obtain the value of n . [3]
- e) If z is normally distributed with mean 0 and variance 1, evaluate $P(z \leq 1.64)$. [2]
- f) Obtain the s.d. of the sampling distribution of means of 300 random samples each of size $n = 36$ are drawn from a population of $N = 1500$ which is normally distributed with mean $\mu = 22.4$ and s.d. σ of 0.048, if sampling is done with replacement. [3]
- g) Discuss the level of significance and type of errors. [2]
- h) Explain the terms null and alternate hypotheses. [3]
- i) Define Markov chain. [2]
- j) Is the matrix $\begin{pmatrix} 0 & 1 & 0 \\ 0.5 & 0.25 & 0.25 \end{pmatrix}$ stochastic? [3]

PART – B

(50 Marks)

2. Suppose colored balls are distributed in three indistinguishable boxes as follows:

	Box I	Box II	Box III
Red	2	4	3
White	3	1	4
Blue	5	3	3

A box is selected at random from which a ball is selected at a random. What is the probability that the ball is colored a) red, b) blue? [10]

OR

- 3.a) Define random variable.
- b) Suppose a continuous function X has the probability density function

$$f(x) = \begin{cases} 2k e^{-x^2}, & x > 0 \\ 0, & x \leq 0 \end{cases}$$

Compute (i) k , (ii) the distribution function for X , and (iii) $P(1 < X \leq 2)$. [2+8]

4. A pair of fair dice is tossed. Let X denote the maximum of the number appearing i.e., $X(a, b) = \max(a, b)$ and Y denotes the sum of the numbers appearing i.e., $Y(a, b) = a + b$. Compute the mean, variance and standard deviation of the distribution of both X and Y . [10]

OR

- 5.a) Given that $P(X = 2) = 45.P(X = 6) - 3.P(X = 4)$ for a Poisson variate X , find the probability that $3 < X < 5$.
- b) A car firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variable with mean 1.5. Calculate the probability that on a day some demand is refused. [5+5]
- 6.a) Find the mean and standard deviation of a normal distribution in which 7% of items are under 35 and 89% are under 63.
- b) A random sample of size 100 is taken from an infinite population having the mean 76 and the variance 256. What is the probability that (i) \bar{x} will be in between 75 and 78, (ii) \bar{x} will be less than 78? [5+5]

OR

7. A population consists of the five numbers 2, 3, 6, 8, and 11. Consider all possible samples of size 2 that can be drawn without replacement from this population. Find (a) the mean of the population, (b) the standard deviation of the population, (c) the mean of the sampling distribution of means, and (d) the standard deviation of the sampling distribution of means. [2+3+2+3]
8. The efficiency expert of a computer company tested 40 engineers to estimate the average time it takes to assemble a certain computer component, getting a mean of 12.73 minutes and s.d. of 2.06 minutes. (a) If $\bar{x} = 12.73$ is used as a point estimate of the actual average time required to perform the task, determine the maximum error with 99% confidence, (b) construct 98% confidence intervals for the true average time it takes to do the job (c) with what confidence can we assert that the sample mean does not differ from the true mean by more than 30 seconds. [2+3+2+3]

OR

9. The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety programme was put into operation:
- | | | | | | | | | | | |
|---------|----|----|----|-----|----|----|----|----|----|----|
| Before: | 45 | 73 | 46 | 124 | 33 | 57 | 83 | 34 | 26 | 17 |
| After : | 36 | 60 | 44 | 119 | 35 | 51 | 77 | 29 | 24 | 11 |
- Test whether the safety programme is effective in reducing the number of accidents at the level of significance of 0.05? [10]
10. An urn A contains 5 red, 3 white and 8 green marbles while urn B contains 3 red and 5 white marbles. A fair die is tossed; if 3 or 6 appears a marble is chosen from B otherwise from A. Determine the probability that
- a) a red marble is chosen, b) a white marble is chosen, c) a green marble is chosen. [4+3+3]

OR

11. Suppose an urn A contains 2 white marbles and urn B contains 4 red marbles. At each step of the process, a marble is selected at random from each urn and the two marbles selected are interchanged. Let X_n denote the number of red marbles in urn A after n interchanges. (a) Find the transition matrix P . (b) What is the probability that there are 2 red marbles in urn A after 3 steps. [5+5]

Code No: 153AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, August/September – 2022

COMPUTER ORIENTED STATISTICAL METHODS

(Common to CSE, IT, CSE(SE), CSE(IOT), CSE(N))

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- - -

- 1.a) Three machines I, II and III produce 40%, 30% and 30% of the total number of items of a factory. The percentages of defective items of these machines are 4%, 2% and 3%. An item is selected at random and found to be defective. Find the probability that it is from
i) Machine-I ii) Machine-II iii) Machine-III
- b) A continuous Random variable has the p.d.f $f(x) = \begin{cases} e^{-x} & \text{If } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$
Determine: i) $P(0 \leq x \leq 2)$ ii) The mean iii) Variance. [8+7]
- 2.a) There are three boxes.
I contains- 10 light bulbs out of which 4 are defective
II contains- 6 light bulbs out of which 1 is defective
III contains- 8 light bulbs out of which 3 are defective
A box is chosen at random and a bulb is selected. If it is defective find the probability that it is from:
i) Box-I ii) Box-II iii) Box-III
- b) A continuous Random variable has the p.d.f $f(x) = \begin{cases} \frac{1}{2}(x+1) & -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$. Determine:
i) $P(2 \leq x \leq 4)$ ii) The mean iii) Variance. [8+7]
- 3.a) Six cards are drawn from a pack of 52 cards. Getting a red card is a success. Find the probability of getting the success:
i) At least once ii) 3 times
- b) The probabilities of a Poisson variate taking the values 1 and 2 are equal. Find:
i) μ ii) $P(x \geq 1)$ [8+7]
- 4.a) Assume that 60% of the students passed an examination. Find the probability that among 12.
i) Exactly 8 ii) At least 4 pass the examination
- b) If the variance of a Poisson variate is 3. Find the probability that:
i) $P(x=0)$ ii) $P(1 \leq x < 4)$. [8+7]

5.a) In a test on electrical bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 40 hrs. Estimate the number of bulbs likely to burn formore than 2140.

b) Two horses A, B were tested according to the time (in seconds) to run a particular track with the following results.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

Test whether the two horses have the same running capacity at 95 % level. [8+7]

6.a) If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3kgs. How many students have masses?

i) Greater than 72 kgs ii) Between 65 and 71 kgs

b) The following table gives the number of train accidents in a country that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week. Test at the level of 0.05. [7+8]

Days	Sun	Mon	Tues	Wed	Thurs	Fri	Satur
No. of accidents	20	18	13	23	26	11	15

7.a) A sample of 900 members has a mean 3.4 cms and S.D 2.61 cms. Is this sample has been taken from a large population of mean 3.25 and S.D 2.61.

b) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions is significant at 0.05 level of significance. [7+8]

8. The school of international studies for population found out by its survey that the mobility of the population of a state to village, town and city is in the followingpercentage.

		To		
		Village	town	city
From	Village	30%	20%	50%
	Town	30%	50%	20%
	City	10%	40%	50%

What will be the proportion of population in village, town and city after two years? Present population has proportion of 0.4, 0.3 and 0.3 village, town and city respectively. Find the proportions in the long run. [15]

Code No: 153AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, March - 2021****COMPUTER ORIENTED STATISTICAL METHODS****(Common to CSE, IT)****Time: 3 hours****Max. Marks: 75****Answer any five questions****All questions carry equal marks**

- - -

1. Two dice are thrown the random variable is assigned to the sum. Write the distribution. Find the mean and variance. [15]
- 2.a) If the probability distribution function of a continuous random variable is ke^{kx} , $-\alpha \leq x \leq \alpha$. Find i) k ii) mean iii) variance.
- b) A sample of 4 items is selected from 12 out of which 5 are defective. Find the expected number of defective items. [8+7]
- 3.a) Eight coins are tossed. Find the probability of getting heads: i) $p(x=3)$ ii) $p(x \leq 4)$.
- b) The probabilities of a Poisson variate taking the values 1 and 2 are equal. Calculate: i) $p(x=0)$ ii) $p(x=3)$ [7+8]
- 4.a) Mean heights of students is 159cms with a standard deviation of 20. Find how many students heights lie between 150cms and 170cms in a class of 100 students.
- b) The expected number of typographical errors on a page of a certain magazine is 0.2. What is the probability that the next page you read contains i) 0 and ii) 2 or more typographical errors? [7+8]
5. From the following data find whether there is any significant liking in the habit of taking soft drinks among the categories of employees. [15]

Soft drinks	Employees		
	Clerks	Teachers	Officers
Pepsi	10	25	65
Thumsup	15	30	65
Maaza	50	60	30

6. Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results. Test whether two horses have the same running capacity.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	-

[15]

- 7.a) A random sample of 100 electric bulbs, produced by a manufacturer A showed a mean life of 1190 hrs with a standard deviation of 90. Another sample of 75 electric bulbs produced by a manufacturer B showed a mean life of 1230 with a standard deviation of 120 hrs. Find whether there is significant difference between the mean.
- b) 50 people were attacked by a disease and 30 were survived. If the survival rate is 70%, test the chain at 5% level. [8+7]

8. Consider a three-state Markov chain with the transition matrix. If the initial probabilities $P_0 = (0.2, 0.3, 0.5)$.

$$P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 2/3 & 1/3 \\ 1/16 & 15/16 & 0 \end{bmatrix}$$

- a) Find the probabilities after two transitions.
- b) Find the limiting probabilities. [8+7]

---ooOoo---

Code No: 153AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, March - 2022

COMPUTER ORIENTED STATISTICAL METHODS

(Common to CSE, IT, CSE(SE), CSE(IOT), CSEN)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) In a certain college 25% of boys and 10% of girls are studying Mathematics. The girls constitute 60% of the students. If a student is selected and is found to be studying Mathematics, find the probability that the student is a:
i) Girl ii) boy
- b) If $f(x) = Ke^{-|x|}$ is p. d.f in $-\infty < x < \infty$, find:
i) K ii) the mean iii) Variance. [6+9]
- 2.a) There are three boxes.
I contains- 10 light bulbs out of which 4 are defective
II contains- 6 light bulbs out of which 1 is defective
III contains- 8 light bulbs out of which 3 are defective
A box is chosen at random and a bulb is selected. If it is defective find the probability that it is from:
i) Box- I ii) Box-II iii) Box-III
- b) A continuous Random variable has the p.d.f $f(x) = \begin{cases} Kxe^{-\lambda x} & \text{If } x \geq 0, \lambda \geq 0 \\ 0 & \text{otherwise} \end{cases}$. Determine
i) K ii) The mean iii) variance. [6+9]
- 3.a) The probability of man hitting a target is $1/3$. If he fires 6 times, find the probability of hitting:
i) At the most 5 times ii) At least 5 times
- b) The probabilities of a Poisson, variate taking the values 1 and 2 are equal. Find:
i) μ ii) $P(x \geq 1)$. [8+7]
- 4.a) Assume that 50% of the Engineers are good in Mathematics. Find the probability that among 9:
i) Exactly 5 ii) At least 6
- b) If x is a Poisson variate such that $3P(x=4) = 1/2P(x=2) + P(x=0)$. Find:
i) μ ii) $P(x \leq 2)$. [7+8]
- 5.a) Write the properties of normal distribution.
b) Find the mean and variance of gamma distribution. [7+8]
- 6.a) The weekly wages of 1000 workers are normally distributed with mean Rs. 70 and a standard deviation of Rs. 5. If x is the weekly wages. Find:
i) $P(68 < x < 72)$ ii) $P(60 < x < 75)$
- b) A random sample from a company's very extensive files shows that orders for a certain piece of machinery were filled, respectively in 10,12,19,14,15,18,11 and 13 days. Test the claim that on the average such orders are filled in 10.5 days. Test at 0.01 level. [7+8]

- 7.a) A candidate for election made a speech in a city. Among 500 voters from city A 59.6% are in favour of him where as among 300 voters from city B 50% are in favour of him. Test the significance between the differences of two proportions at 5% level.
- b) A random sample of size 500 was taken whose S.D is 6 and the mean is 40 Construct 95% confidence interval for the mean. [8+7]
8. A professor has three pet questions, one of which occurs on every test he gives. He never uses the same question twice in successive examinations. If he used the question no. 1, he tosses a coin and uses the question no. 2. If he uses the question no. 2, he tosses two coins and use the question no. 3, if both are heads. If he uses the question no. 3, he tosses three coins and use the question no 1, if all are heads. In long run which question does he use most often and with how much frequency is it used. [15]

---ooOoo---

Code No: 153AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, October - 2020

COMPUTER ORIENTED STATISTICAL METHODS

(Common to CSE, IT)

Time: 2 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) State Baye's theorem. Two factories produce identical clocks. The production of the first factory consists of 10,000 clocks of which 100 are defective. The second factory produces 20,000 clocks of which 300 are defective. What is the probability that a particular defective clock was produced in the first factory?
- b) Given $f(x) = \begin{cases} ax^2, & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$
Find the constant a . Also find distribution function $F(x)$, mean and variance of X . [8+7]
- 2.a) If A and B are any two events (subsets of the sample space S) and are not disjoint, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
- b) If two dice are thrown, what is the probability that the sum is (i) greater than 8, and (ii) neither 7 nor 11? [8+7]
- 3.a) State and prove Chebyshev's Theorem.
- b) Show that in a Poisson distribution with unit mean, the mean deviation about the mean is $2/e$ times the standard deviation. [8+7]
- 4.a) Derive the mean and variance of Poisson distribution.
- b) The incidence of occupational diseases in an industry is such that the workmen have a 10% chance of suffering from it. What is the probability that in a group of 7, five or more will suffer from it? [8+7]
- 5.a) Explain normal distribution. If X is normally distributed with mean 1 and standard deviation 0.6, obtain $P(x > 0)$ and $P(-1.8 \leq X \leq 2.0)$.
- b) Ten individuals are chosen at random from a normal population and their heights are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71 inches. Test if the sample belongs to the population whose mean height is 66 inches. [7+8]
- 6.a) Explain exponential distribution and show that exponential distribution tends to normal distribution for large values of the parameter λ .
- b) A random sample of 16 values from a normal population has a mean of 41.5 inches and sum of squares of deviations from the mean is equal to 135 inches. Another sample of 20 values from an unknown population has a mean of 43.0 inches and sum of squares of deviations from their mean is equal to 171 inches. Show that the two samples may be regarded as coming from the same normal population. [7+8]

7.a) A manufacturer claimed that at least 98% of the steel pipes which he supplied to a factory conformed to specifications. An examination of a sample of 500 pieces of pipes revealed that 30 were defective. Test this claim at a significance level of 0.05.

b) A machine puts out 16 imperfect articles in a sample 500. After machine is overhauled, it puts out 3 imperfect articles in a batch of 100. Has the machine improved? Test at 5% level of significance. [7+8]

8.a) Define Markov chain and classify its states.

b) Suppose there are two market products of brand A and B, respectively. Let each of these two brands have exactly 50% the total market in same period and let the market be of a fixed size. The transition matrix is given as follows:

		To	
		A	B
From	A	0.9	0.1
	B	0.5	0.5

If the initial market share breakdown is 50% for each brand, then determine their market shares in the steady state. [7+8]

---ooOoo---